

Course Code	Course Name	Credits
<b>MEC303</b>	<b>Production Processes</b>	<b>04</b>

**Objectives:**

1. To familiarize with the various production processes used on shop floors
2. To study appropriate production processes for a specific application.
3. To introduce to the learner various machine tools used for manufacturing
4. To familiarize with principle and working of non-traditional manufacturing
5. To introduce to them the Intelligent manufacturing in the context of Industry 4.0

**Outcomes:** Learner will be able to....

1. Demonstrate an understanding of casting process
2. Illustrate principles of forming processes.
3. Demonstrate applications of various types of welding processes.
4. Differentiate chip forming processes such as turning, milling, drilling, etc.
5. Illustrate the concept of producing polymer components and ceramic components.
6. Illustrate principles and working of non-traditional manufacturing
7. Understand the manufacturing technologies enabling Industry 4.0

Module	Details	Hrs.
<b>1</b>	<b>Introduction to Production Processes and Metal Casting</b> 1.1. Classification of Production Processes and applications areas 1.2. Pattern making materials, Types of pattern and allowances. 1.3. Sand moulding and Machine moulding 1.4. Gating system :Types of riser, types of gates, solidification 1.5. <b>Special casting processes</b> : CO2 and shell moulding, Investment casting, Die casting, Vacuum casting, Inspection & casting defects and remedies	<b>09</b>
<b>2</b>	<b>Joining Processes</b> 2.1. Classification of various joining processes; Applicability, advantages and limitations of Adhesive bonding, Mechanical Fastening; Welding and allied processes, Hybrid joining processes. 2.2. Classification and Working of various welding methods: Gas, Arc, Chemical, Radiant, Solid State etc. 2.3. Welding Joints, Welding Positions, Welding defects and their remedies.	<b>09</b>
<b>3</b>	<b>3.1. Forming processes</b> <ul style="list-style-type: none"> <li>• Introduction and classification of metalworking processes, hot and cold working processes</li> <li>• Introduction, classification and analysis of forging and rolling operations, Defects in rolled and forged components,</li> <li>• Extrusion process, Classification and analysis of wire and tube drawing processes.</li> </ul> <b>3.2. Sheet metal working processes</b> <ul style="list-style-type: none"> <li>• Classification of Sheet metal operations, types of Presses used in sheet metal operations, types of dies.</li> </ul>	<b>09</b>

<b>4</b>	<p><b>4.1. Machine Tools, Machining Processes.</b></p> <ul style="list-style-type: none"> <li>• <b>Machine Tools and Machining Processes:</b> Lathe Machines, Milling Machines, Drilling Machines, and Grinding Machines and selection of grinding wheel (Dressing and Truing), Broaching machines, Lapping/Honing machines (Super Finishing Operations) and shaping/slotting/planning Machines.</li> <li>• <b>Gear Manufacturing</b> Gear milling, standard cutters and limitations, Gear Hobbing, Gear Shaping, Gear Shaving and Gear Grinding processes</li> </ul> <p><b>4.2. Tool Engineering</b></p> <ul style="list-style-type: none"> <li>• Geometry and nomenclature of single point cutting tool, Speed, feed, depth of cut, Taylor's tool life equation, Concept of chip formation and types of chips. Introduction to Jigs and Fixtures and types.</li> </ul>	<b>12</b>
<b>5</b>	<p><b>5.1 Non Traditional Machining Processes:</b></p> <ul style="list-style-type: none"> <li>• Electro-chemical machining (ECM)</li> <li>• Electric-discharge machining (EDM)</li> <li>• Ultrasonic machining (USM)</li> <li>• Laser Beam Machining (LBM)</li> </ul>	<b>05</b>
<b>6.</b>	<p><b>6.1 Polymer Processing:</b></p> <ul style="list-style-type: none"> <li>• Polymer Molding Techniques for thermoplastic and thermosetting plastics. Applications of Plastics in engineering field.</li> </ul> <p><b>6.2 Powder Metallurgy:</b></p> <ul style="list-style-type: none"> <li>• Introduction to PM, Powder making processes, Steps in PM. Compaction and Sintering processes. Secondary and finishing operations in PM.</li> </ul> <p><b>6.3 Intelligent manufacturing in the context of Industry 4.0,</b></p> <ul style="list-style-type: none"> <li>• Cyber-physical systems (CPS)</li> <li>• Internet of Things (IoT) enabled manufacturing</li> <li>• Cloud Manufacturing</li> </ul>	<b>08</b>

**Assessment:**

**Internal Assessment for 20 marks:** Consisting Two Compulsory Class Tests First test based on approximately 40% of contents and second test based on remaining contents (approximately 40% but excluding contents covered in Test I). Duration of each test shall be one hour.

**End Semester Examination:** Weightage of each module in end semester examination will be proportional to number of respective lecture hours mentioned in the curriculum.

1. Question paper will comprise of total six questions, each carrying 20 marks
2. Question 1 will be compulsory and should cover maximum contents of the curriculum
3. Remaining questions will be mixed in nature (for example if Q.2 has part (a) from module 3 then part (b) will be from any module other than module 3)
4. Only Four questions need to be solved.

### References:

1. Welding technology by O P Khanna
2. Foundry technology by O P Khanna
3. Elements of workshop technology. Vol. 1 & II by S K HajraChoudhury
4. Manufacturing Science by Ghosh and Malik
5. Rapid Manufacturing –An Industrial revolution for the digital age by N.Hopkinson, R.J.M.Hauge, P M, Dickens, Wiley
6. Rapid Manufacturing by Pham D T and Dimov, Springer Verlag
7. Production Technology by WAJ Chapman Vol I, II, III
8. Production Technology by P C Sharma.
9. Production Technology by Raghuvanshi.
10. Industry 4.0: The Industrial Internet of Things by Alasdair Gilchrist, 2016, Apress.
11. Cyber-Physical Systems: From Theory to Practice by Danda B. Rawat, Joel Rodrigues, Ivan Stojmenovic, 2015, C.R.C. Press.
12. Optimization of Manufacturing Systems using Internet of Things by Yingfeng Zhang, Fei Tao, 2017, Academic Press (AP), Elsevier.

### Links for online NPTEL/SWAYAM courses:

1. <https://nptel.ac.in/courses/112/107/112107219/>
2. <https://nptel.ac.in/courses/112/107/112107215/>
3. <https://nptel.ac.in/courses/112/107/112107084/>
4. <https://nptel.ac.in/courses/112/107/112107144/>
5. <https://nptel.ac.in/courses/112/107/112107078/>
6. <https://nptel.ac.in/courses/112/107/112107239/>
7. <https://nptel.ac.in/courses/112/104/112104195/>
8. <https://nptel.ac.in/courses/112/107/112107219/>
9. <https://nptel.ac.in/courses/112/107/112107144/>
10. <https://nptel.ac.in/courses/112/107/112107213/>
11. <https://nptel.ac.in/courses/112/107/112107090/>
12. <https://nptel.ac.in/courses/113/106/113106087/>
13. <https://nptel.ac.in/courses/112/103/112103263/>
14. <https://nptel.ac.in/courses/112/107/112107239/>
15. <https://nptel.ac.in/courses/112/106/112106153/>
16. <https://nptel.ac.in/courses/112/107/112107250/>
17. <https://nptel.ac.in/courses/112/107/112107144/>
18. <https://nptel.ac.in/courses/112/107/112107239/>
19. <https://nptel.ac.in/courses/112/107/112107219/>